

23 July 2001

CRUISE RESULTS
Fisheries Research Vessel Delaware II
Cruise No. DE 01-05
Ecosystems Monitoring Survey Leg II

CRUISE PERIOD AND AREA

The cruise period was from 29 May to 6 June 2001. The survey area included the eastern edge of the Southern New England region, and the Georges Bank and Gulf of Maine regions (Figure 1). This cruise was the second part of the Late Spring Ecosystem Monitoring Survey, completing coverage of the Survey area that was started by the Albatross IV in late May.

OBJECTIVES

The primary objective of the cruise was to collect standardized samples and data to monitor changing biological and physical properties that influence the sustainable productivity of the living marine resources of the Southern New England, Georges Bank and Gulf of Maine portions of the Northeast Continental Shelf ecosystem. Three secondary objectives of the cruise included:

1. An investigation of overwintering populations of Calanus finmarchicus in the Gulf of Maine to determine their metabolic state and lipid reserves, and to ascertain whether this population is augmented by sources from outside this region.
2. Analysis of phytoplankton samples for nitrogen stable isotope ratios by filtering the discharge water of the flow-through instrumentation at 10 locations on this leg of the survey.
3. Examination of sample jars for the presence of large numbers of Calanus finmarchicus to correlate with right whale sightings received by the Right Whale Sighting Network Coordinator in Woods Hole.

METHODS

The survey consisted of 65 randomly distributed stations at which the vessel stopped to lower instrumented arrays over the side.

Key parameters which were measured included water column temperature and salinity, ichthyo and zooplankton composition, abundance and distribution; along-track temperature, salinity, chlorophyll-a fluorescence and standard weather observations.

A double oblique tow using the 61-centimeter Bongo sampler and a CTD was made at all stations. The tow was made to approximately 5 meters above the bottom, or to a maximum depth of 200 meters, at a ship speed of 1.5 knots. Plankton sampling gear consisted of a 61-centimeter mouth diameter aluminum bongo frame with two 333-micron nylon mesh nets. A 45-kilogram lead ball was attached by an 80 centimeter length of 3/8-inch diameter chain below the aluminum Bongo frame to depress the sampler. A digital flowmeter was suspended within the mouth of each sampler to determine the amount of water filtered by each net. The plankton sampling gear was deployed over the starboard stern quarter of the vessel by means of a conducting-cable winch and an A-frame. Plankton samples were preserved in a 5 percent solution of formalin in seawater. Tow depth was monitored in real time with a Seabird CTD profiler, which was hard-wired to the conductive towing cable, providing simultaneous depth, temperature and salinity data for each plankton tow.

Continuous monitoring of the seawater temperature, salinity, and chlorophyll-a level, at a depth of 2 meters was done along all of the cruise track by means of a thermosalinograph, and flow-through fluorometer.

The thermosalinograph and flow-through fluorometer were connected to the Scientific Computing System installed in the laboratory area of the vessel by Office of Marine and Aviation Operations personnel. This system recorded output from the thermosalinograph, and the fluorometer every ten seconds, and gave the data records a time-date stamp from the GPS unit.

Samples for Seabird salinity data calibration were obtained on the 12-6 watch by taking a water sample from 30 or more meters depth using a 1.7 liter Niskin bottle at every fifth or sixth station. Calibration of the thermosalinograph and fluorometer from the surface flow-through system was undertaken on the 6-12 watch following the protocol outlined in the Ecosystem Monitoring Program Operations Manual, in review, pp 61-68.

SUMMARY OF SPECIAL ACTIVITIES

- Phytoplankton samples for nitrogen stable isotope ratio analysis were collected from the discharge water of the near-surface flow-through system. Six hundred to one thousand milliliters of seawater were pre-filtered through 300 micron mesh nitex gauze to remove most zooplankton, then filtered through a Whatman, glass-fiber filter (GFF) and immediately frozen, for analysis ashore.
- Sample jars from all stations were examined during the cruise for the presence of large quantities of Calanus finmarchicus. At stations where it was determined that this species comprised more than 75% of the sample visible to the eye through the glass sides of the jar, the settled height of the zooplankton was measured in centimeters. These settled zooplankton heights of >75% Calanus finmarchicus were multiplied by the cross-sectional area of the quart sample jars (52.8 cm²) to produce an estimate of settled volume in cm³ of this species for comparison between stations that were sampled on the cruise.
- Plankton tows using a 1-meter MOCNESS sampler were made at four stations in the Gulf of Maine area for the Calanus finmarchicus studies conducted by Edward Durbin and Whitley Saumweber. The MOCNESS was deployed from the starboard aft A-frame using the ship's crane to help with the initial deployment and final part of the retrieval. It was towed at 1.5 knots to within 5 meters of the bottom using the same Sea Mac winch that was used for the bongo tows. Four opening and closing nets of 300 micron mesh were used for sampling. Analysis of the samples was conducted on board the vessel immediately after retrieving the MOCNESS.

RESULTS

A summary of routine survey activities is presented in Table 1. Figure 1 shows the areal coverage achieved during the cruise. After sailing from the NMFS dock in Woods Hole at 1500 EDT on Tuesday 29 May 2001, the Delaware II commenced sampling operations later that same day near Martha's Vineyard and Nantucket shoals. The vessel completed the five remaining southern New England stations and continued on to the Georges Bank area, which was sampled in a counter-clockwise manner. Winds and seas picked up on the third day out, while the vessel was at the midpoint of Georges Bank, slowing, but not stopping the progress of the work. Fortunately the adverse weather subsided by the time the vessel reached the Northeast Peak of Georges, permitting sampling and analysis

operations to be carried out by the Graduate School of Oceanography (GSO) contingent at their first two sampling areas: the Northeast Channel and Georges Basin. Deployment and retrieval of the MOCNESS sampler, and subsequent microscopic examination of the samples, required calmer conditions than did the ecosystem monitoring sampling. After completing the Georges Basin station, the DELAWARE II returned to Georges Bank, worked its way southwest across the shoal area and completed all Georges Bank sampling by 2 June. The vessel proceeded on to the Gulf of Maine and commenced sampling there on that same day. Although strong southwest winds were blowing at this time, the DELAWARE made good progress since it was traveling with the seas. Improving weather allowed the DELAWARE II to continue making good progress as it proceeded around the Gulf of Maine on a counter-clockwise cruise track. Two more joint ECO/GSO stations were sampled; one in Jordan Basin and the last one in Wilkinson Basin. All work went smoothly at these stations, with the GSO sampling being completed within two hours at each station. As it became apparent that the vessel was ahead of schedule, two extra bongo tows were made for the GSO scientists; one on the Scotian Shelf and the other in Cape Cod Bay. Throughout the cruise, jars of plankton samples that had a visible abundance of Calanus finmarchicus had their zooplankton volumes estimated according to the protocol listed under the Summary of Special Activities, and this information was forwarded by email to Patricia Gerrior, the Right Whale Sighting Network Coordinator in Woods Hole. Samples with visibly high concentrations of Calanus finmarchicus appeared in the vicinity of the Great South Channel, the northern edge of Georges Bank and the south central Gulf of Maine. Sampling operations were completed on 5 June and the vessel returned through the Cape Cod Canal the next day. After an initial stop at the WHOI dock at 0800 EDT to exchange the Sea Mac winch for another one in preparation for the next cruise, the vessel docked at NMFS at 0900 EDT June 6.

DISPOSITION OF SAMPLES AND DATA

All bongo samples and data, except the CTD data and the two GSO bongo samples, were delivered to the Ecosystems Monitoring Group of the NEFSC, Narragansett, RI, for quality control processing and further analysis. The CTD data was delivered to the Oceanography Branch of the NEFSC, Woods Hole, MA. The MOCNESS and GSO bongo samples and data were taken by the GSO scientists to the Graduate School of Oceanography in Rhode Island.

SCIENTIFIC PERSONNEL

National Marine Fisheries Service, NEFSC, Narragansett, RI

Jerome Prezioso, Chief Scientist
Jacquelyn Anderson
Joyce Denecour

Roger Williams University, Bristol, RI

Abbyjane McLean

University of Rhode Island, Graduate School of Oceanography,
Narragansett, RI

Maria Casas
Niele DiNitto
Whitely Saumweber
Edward Durbin

For further information contact:
Sharon MacLean, Group Leader, Ecosystem Monitoring Group,
National Marine Fisheries Service, Northeast Fisheries Science
Center, Narragansett, RI 02882.
Tel (401) 782-3258 FAX (401) 782-3201; INTERNET
"sharon.maclean@noaa.gov".

Table 1. Station data for NOAA FRV DELAWARE II cruise 01-05,
Ecosystems Monitoring Survey, Leg II, conducted during 29 May to 6 June 2001.

CAST	STA.	Date(GMT)			TIME(GMT)		LAT	LONG	DEPTH	OPERATION
		mm	dd	yy	hr	min			(m)	(b=bongo w=water C= <u>Calanus</u> observed N=nitrogen)
001	001	5	29	01	22	21	4118.7	7040.8	20	b
002	002	5	29	01	23	38	4110.5	7031.1	36	b
003	003	5	30	01	01	18	4100.6	7015.5	32	b
004	004	5	30	01	07	08	4036.6	6915.8	58	w
005	004	5	30	01	07	26	4036.8	6915.8	62	b
006	005	5	30	01	10	32	4011.7	6901.1	132	b
007	006	5	30	01	13	33	4033.7	6847.1	66	b
008	007	5	30	01	14	56	4027.8	6833.6	89	b, C
009	008	5	30	01	16	56	4019.4	6816.8	148	w,
010	008	5	30	01	17	07	4019.3	6816.7	149	b
011	009	5	30	01	19	15	4031.9	6800.5	104	b, N #10
012	010	5	30	01	20	37	4044.2	6757.5	71	b, C
013	011	5	30	01	22	51	4056.0	6817.5	48	b
014	012	5	31	01	00	58	4054.3	6748.6	60	b
015	013	5	31	01	02	08	4048.5	6736.2	74	b
016	014	5	31	01	04	21	4047.3	6710.5	97	w
017	014	5	31	01	04	29	4047.2	6710.4	97	b
018	015	5	31	01	06	26	4102.7	6705.1	70	b
019	016	5	31	01	07	46	4111.0	6716.7	58	b
020	017	5	31	01	09	07	4119.0	6704.7	61	b
021	018	5	31	01	10	32	4130.7	6709.3	53	b
022	019	5	31	01	12	19	4137.4	6655.9	66	b
023	020	5	31	01	14	22	4141.5	6639.8	66	b, N #11
024	021	5	31	01	16	23	4127.3	6642.5	77	b
025	022	5	31	01	18	29	4108.6	6647.0	72	b
026	023	5	31	01	20	24	4118.4	6630.8	92	b
027	024	5	31	01	22	42	4121.4	6605.8	260	b
028	024	5	31	01	23	10	4121.1	6606.5	244	w
029	025	6	1	01	01	49	4142.1	6549.7	138	b
030	026	6	1	01	05	30	4115.9	6618.6	80	b
031	027	6	1	01	08	02	4204.4	6649.5	69	b
032	028	6	1	01	09	34	4216.6	6641.8	280	b, C
033	028	6	1	01	10	03	4217.0	6643.2	284	v
034	029	6	1	01	11	42	4217.3	6626.8	267	b, C
035	029	6	1	01	12	16	4217.1	6627.8	265	v
036	030	6	1	01	15	45	4229.7	6627.3	255	w
037	030	6	1	01	16	09	4229.4	6627.2	258	b
038	031	6	1	01	17	46	4226.1	6642.7	338	v
039	031	6	1	01	18	16	4226.0	6642.4	343	b
040	032	6	1	01	20	56	4222.0	6713.6	315	b
041	033	6	2	01	00	01	4209.6	6710.4	106	b, C

Table 1. (Continued)

CAST	STA.	Date(GMT)			TIME(GMT)		LAT	LONG	DEPTH	OPERATION (b=bongo w=water C= <u>Calanus</u> observed N=nitrogen)
		mm	dd	yy	hr	min			(m)	
042	034	6	2	01	02	38	4154.4	6729.1	54	b
043	035	6	2	01	03	57	4150.7	6741.4	37	w
044	035	6	2	01	04	05	4150.5	6741.3	35	b
045	036	6	2	01	05	36	4135.9	6734.6	39	b
046	037	6	2	01	08	06	4113.4	6748.4	43	b
047	038	6	2	01	09	32	4123.5	6802.3	37	b, N #12
048	039	6	2	01	10	57	4125.0	6819.7	53	b
049	040	6	2	01	12	05	4135.1	6823.5	26	b, C
050	041	6	2	01	14	17	4121.3	6839.4	87	b, C
052	042	6	2	01	19	57	4209.2	6905.7	176	b
051	042	6	2	01	19	46	4208.8	6905.6	175	w
052	042	6	2	01	19	57	4209.2	6905.7	176	b
053	043	6	3	01	00	20	4251.8	6854.1	110	b
054	044	6	3	01	04	17	4228.2	6840.8	198	b, C
055	045	6	3	01	06	20	4217.4	6825.5	203	b, C
056	046	6	3	01	09	49	4229.6	6748.8	233	b
057	046	6	3	01	10	17	4228.9	6748.9	230	v
058	047	6	3	01	14	31	4246.4	6703.1	211	b
059	048	6	3	01	17	8	4246.1	6635.7	156	w
060	048	6	3	01	17	17	4246.2	6635.7	159	b
061	049	6	3	01	19	28	4246.6	6610.8	56	b
062	050	6	3	01	21	40	4303.5	6558.8	95	b, N #13
063	050	6	3	01	21	55	4303.6	6559.0	100	w
064	050	6	3	01	22	3	4303.8	6559.5	98	b
065	051	6	4	01	00	17	4309.8	6628.7	105	b
066	052	6	4	01	03	11	4321.9	6702.9	206	b, N #14
067	053	6	4	01	06	25	4346.2	6711.4	168	w
068	053	6	4	01	06	34	4346.1	6711.4	163	b
069	054	6	4	01	09	12	4407.3	6705.4	100	b, N #15
070	055	6	4	01	12	3	4413.9	6741.3	115	b
071	056	6	4	01	15	3	4347.1	6740.6	233	b
072	056	6	4	01	15	33	4346.4	6740.1	234	w
073	057	6	4	01	19	39	4350.9	6819.5	133	w
074	057	6	4	01	19	46	4350.8	6819.4	139	b
075	058	6	4	01	23	58	4320.1	6745.6	266	b
076	058	6	5	01	00	23	4319.6	6745.7	261	v
077	059	6	5	01	02	45	4300.1	6745.2	200	b, N #16
078	060	6	5	01	06	14	4315.9	6825.8	171	w
079	060	6	5	01	06	22	4315.8	6825.6	173	b, N #17
080	061	6	5	01	08	55	4332.4	6842.6	143	b
081	062	6	5	01	13	32	4320.5	6940.4	189	b
082	062	6	5	01	14	8	4321.0	6940.2	168	b, N #18
083	063	6	5	01	17	24	4251.0	6936.6	167	w

Table 1. (Continued)

CAST	STA.	Date(GMT)			TIME(GMT)		LAT	LONG	DEPTH	OPERATION
		mm	dd	yy	hr	min			(m)	(b=bongo w=water C= <u>Calanus</u> observed N=nitrogen)
084	063	6	5	01	17	32	4251.0	6936.5	165	b
085	064	6	5	01	20	11	4227.1	6931.0	260	b
086	064	6	5	01	20	36	4226.7	6931.5	261	w
087	065	6	6	01	00	12	4226.3	6957.4	140	b
	066	6	6	01	03	38	4158.4	7021.1	surface	N #19

TOTALS: Bongo Casts = 67
 Bongo Samples = 132
 Water Samples = 15
 CTD Casts = 87

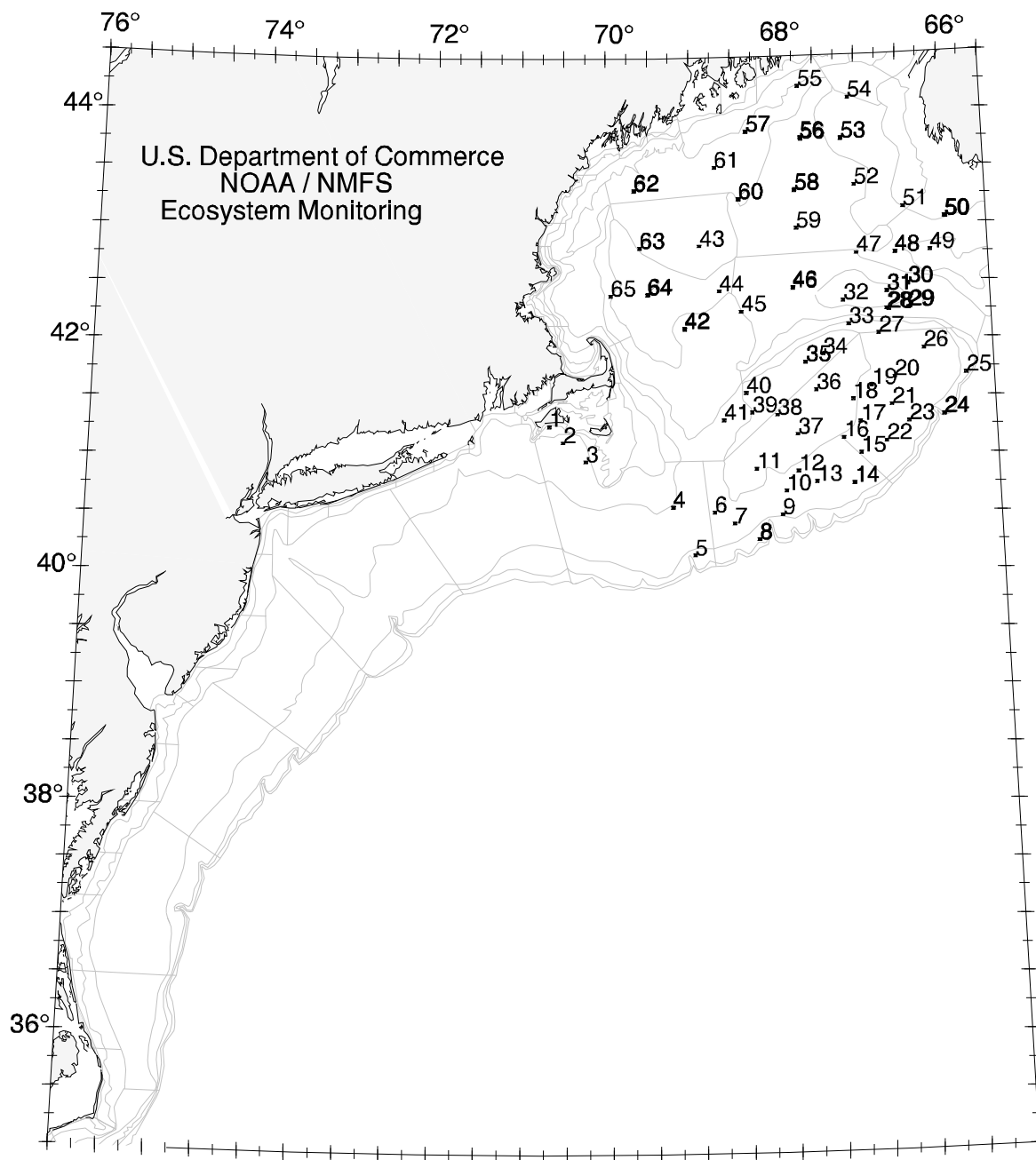


Figure 1. Station locations numbered consecutively for Late Spring Ecosystems Monitoring Cruise Leg II. DE 01-05, 29 May - 6 June 2001.